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GASTROSTOMY BY A CIRCULAR VALVE METHOD.

Gastrostomy, since it was first suggested by Egeberg in 1837 and performed by Sedillot in 1849, has undergone many transformations in the evolution of technique. The primitive operations as done by Sedillot, Fenger, Foster, Durham, Langenbeck, Krönlein and Verneuil, consisted simply in making the external incision through the abdominal wall and fastening the stomach in the wound with sutures or steel needles as a support, and then incising it. There naturally was no resistance to the stomach contents, the great obstacle to gastrostomy. The operation fell into ill repute and practically lay dormant until the present decade, when it was revived and received an impetus in the modern methods of Von Hacker, Hahn, Witzel, Ssabanajew and Frank, in the hope of rectifying the disagreeable features that are inevitable in a continual leakage of a gastric fistula. It is rather strange when we compare the great mortality attendant upon gastrostomy with that of colostomy, which is the identical operation lower down the alimentary canal, and entails little risk to life under corresponding conditions. The mortality varies according to different observers. Of 207 cases collected by Gross, 167 were for cancer and 40 for cicatricial stenosis, with a death rate of 29.47 per cent. from the operation itself. Dr. N. Senn estimates it at 25 per cent.; while Zesas is more radical than either of the other observers, and places the mortality at 60 per cent. for cicatricial stenosis and 84 per cent. for malignant cases. This great mortality is probably due in a great measure to the extreme emaciation which patients undergo before they will submit to operation. In stenosis of the rectum, both

benign and malignant, we meet with the same conditions, but without such a frightful mortality. I am of the opinion that the great shock which so often follows gastrostomy is in a great degree due to the tension exerted on the rich plexuses of the sympathetic system which have such an intimate relation with the stomach. This is especially the case when there is considerable contraction of the stomach. Before dwelling on the subject of this paper, it will be in order to review the muscular structures of the stomach in a concise manner. The muscular coat, which here is exceedingly well developed, consists of three layers: 1, longitudinal, the most superficial; 2, circular or transverse; 3, oblique, the deepest layer. The use of the muscular fibers are: 1, adaptation of the stomach to the quantity of food; 2, to keep the stomach closed until the food is digested; 3, peristaltic movements. The contractile power of the walls in the pyloric region is the most energetic, as here more force is necessary to overcome the resistance of the pylorus. Nevertheless the stomach throughout its continuity is a powerful muscular organ and its walls tend to contract when stimulated. This phenomenon was beautifully demonstrated in the case of St. Martin, where the bulb of the thermometer was tightly grasped when placed in a gastric fistula. This natural adaptation of the stomach to its contents in the old-fashioned gastrostomy is interfered with to a certain extent by the adhesions which form between the parietal peritoneum and the stomach. It is in this area, surrounded by adhesions, that the fistula is made, being a straight incision into the stomach with no pretense of making a valve, or of devising an oblique or circuitous route. The strong adhesions to the parietal wall prevented the muscular structures around the fistula to contract or dilate in conformity with the rest of the stomach, and consequently the fistula remained patent. It has been my purpose to plan a logical method of gastrostomy to meet the following indications:

1. To prevent leakage by making a valve of the stomach wall itself, instead of utilizing extrinsic structures to that end, and also for the same purpose to provide a constriction in imitation of a sphincter.

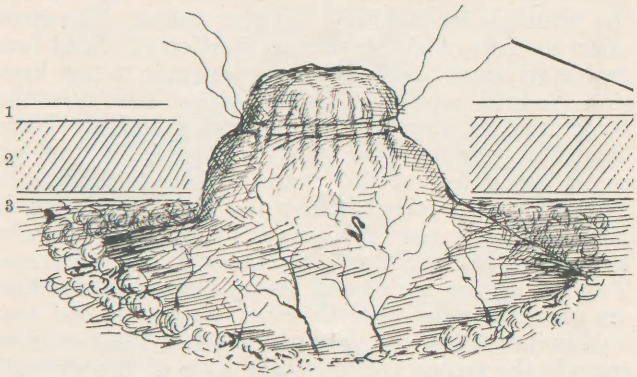

FIG. 1.—Puckering strings in situ. 1, skin; 2, muscle; 3, peritoneum; S, stomach.

2. To minimize shock by putting the least possible strain on the stomach.

3. To have a fistula which remains closed during

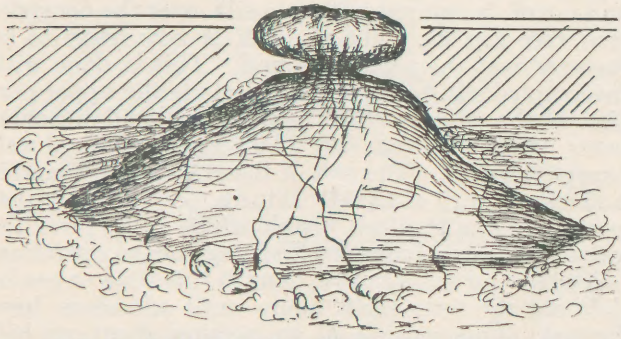

FIG. 2.—Puckering strings tied, forming a constriction.

digestion and can be opened *ad libitum* for the ingestion of food.

In search of an ideal mechanism, I found a proto-

type in the valves of veins. These valves are, as a rule, semilunar, and allow the blood to flow in one direction; but when there is resistance they are set into action and are infallible to regurgitation. I modified the principle by making a circular valve. The operation consists of an abdominal incision of about four inches in length, and which can be made in any location deemed advisable, as no abdominal muscular structures are required for sphincter action. However, Fenger's incision, which is parallel to the left costal border left of the rectus muscle, is preferable. The stomach is seized as near the great curvature as possible and a cone is formed by an assistant, who holds the apex with his fingers or a tissue forceps. Two puckering strings of heavy chromicized catgut are placed parallel to each other about two and one-half inches below the apex of the cone. These sutures include the serous and muscular coats of the stomach (see Fig. 1). These sutures are next drawn taut and tied, forming a constriction or neck (see Fig. 2). This end may also be accomplished by folding the stomach with Lembert sutures, but requires more time. Next, a portion of the gastro-colic omentum is brought up and a cuff is sutured with fine silk over the constriction (see Fig. 3). The stomach is now ready to be fastened into the parietal wound. This is done with interrupted silk sutures which include the upper portion of the omental cuff, the peritoneal and muscular coats of the stomach, and all of the abdominal wall except the skin. The rest of the abdominal wound is now closed with silkworm sutures, leaving only that portion of the stomach visible which is to form the valve. This concludes the first stage of the operation.

The second stage can be done at this time or can be deferred for forty-eight hours until adhesions have formed. This consists of an incision about one-half inch in length in the center of the portion of the stomach exposed. A rubber tube is inserted through this opening into the stomach. The stomach wall is now inverted, forming a circular valve. The inversion

is secured by Lembert sutures of silk (see Fig. 4). The tube is now withdrawn and the operation is completed (see Fig. 5). If properly performed, the valve

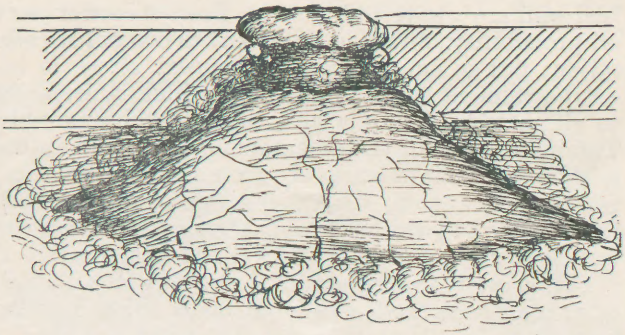

FIG. 3.—Omental cuff covering constriction and stomach sutured to abdominal wall.

should be below the level of the external integument. The retraction is greatly favored by subsequent contraction of the wound.

This method of gastrostomy entirely obviates the

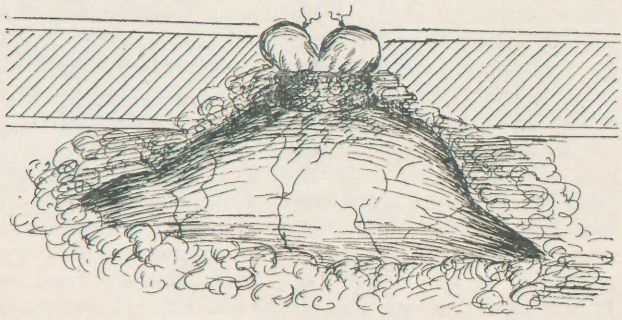

FIG. 4.—Inversion of stomach above constriction and sutured with Lembert sutures, forming a circular valve.

possibility of regurgitation of ingesta. There are two barriers against this mishap, the constriction and the circular valve. The tendency of the constriction, or

neck, is to remain contracted on account of the omento-peritoneal adhesions which surround it. It is also under the inherent control of the muscular walls of the stomach itself, as the adhesions to the abdominal wall are above this point. This constriction, in all probability, would be sufficient to control regurgitation; but as an additional safeguard, stress is laid on the value of the circular valve, which is invincible to all passage of fluids from the stomach externally. The importance of the omental cuff is twofold, in that it aids the maintenance of the neck and acts as a plastic substance to fill in the spaces between the folds formed by the puckering strings, making a continuous surface for suture to the abdominal wall.

Following is the report of a case in which the circular valve method was used with most excellent results:

Mr. M. R. consulted me Aug. 26, 1896, for stenosis of the esophagus. Age 48 years, married; family history negative. He first became aware of difficult deglutition some six months before. This gradually became more marked until he had to subsist entirely upon liquid diet. Fifteen days before the patient came into my hands, the stenosis became complete. The patient was emaciated almost to a skeleton, and presented that cachexia so pathognomonic of malignant disease. He lost approximately sixty pounds in weight. Upon examination of the esophagus, I found the pathologic lesion at the cardiac end of the stomach. With careful manipulation, I was enabled to pass the smallest-sized olive-pointed bougie into the stomach. There were apparently two points of stenosis about an inch apart. The bougie would become engaged in the upper one, then become free, and finally pass through the lower one into the stomach. After exploration there was no bleeding whatever; nor did the patient ever have any hemorrhage. The diagnosis was conclusive of carcinoma of the cardiac end of the stomach, especially with the aid of the clinical history. I suggested gastrostomy as a palliative

measure, and after consultation with his family and friends an operation was agreed upon and the patient sent to St. Joseph's Hospital. The man was so weak, the pulse being only 46, that an operation at this time would most certainly have been fatal. He was given 1-30 gr. of strychnin hypodermatically every three

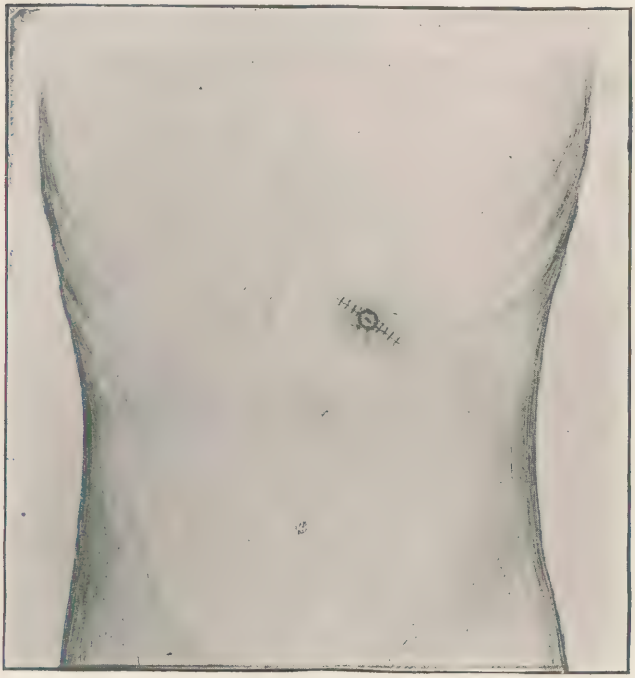

FIG. 5.—Operation completed.

hours and enemata of milk, beaten eggs and whisky, until August 31, at which time he became somewhat stronger.

Operation: Before taken to the operating room, patient was given an enema of black coffee, also a hypodermic of 1-30 gr. of strychnin. Pulse 56.

Anesthetic, ether, which was sparingly given and was administered with great care by Dr. Homer Thomas.

Fenger's incision was made. The abdominal wall was unusually thin. Immediately after opening the abdomen the stomach presented itself, which I found very much contracted. I passed my hand along the great curvature up to the cardiac end, where I felt a hard nodulated mass, which confirmed the diagnosis. The point selected for the gastrostomy was at the greater curvature, and as near the cardiac end as possible without putting tension on the organ. The first stage of the operation was completed in the manner I described before. During the operation, which took twenty minutes, the patient gave evidences of shock and the pulse became almost imperceptible; but he was revived with hypodermics of whisky and external heat. I decided to defer the second stage of the operation, that of making the fistula, for thirty-six hours, until firm adhesions had formed. After reaching his bed, the patient rallied. Temperature 99.2; pulse 82. The patient did well until the evening of September 2, when the temperature rose to 101.8; pulse 120. He also coughed considerably. Upon examination of the chest, I found that lobular pneumonia was present, a complication which is very frequent after gastrostomy. I concluded that procrastination in doing the second stage of the operation would be dangerous. The patient was so debilitated that no anesthetic could be given, nor was it deemed advisable to remove the patient to the operating room; so I completed the operation upon the patient in his bed. Four ounces of peptonized milk was then introduced through the tube. This was continued, with the addition of one ounce of whisky every three hours. The pneumonia gradually left and the patient grew stronger. Ten days after the operation he was able to sit up and he left the hospital after three weeks, although the disease was pursuing its relentless course.

Remarks: After each feeding the tube was removed, and at no time was there the least leakage from the fis-

tula. The valve was easily opened with slight pressure of the tube, as was also the constriction. Upon withdrawal of the tube, the valve would close with the precision of a trap-door. I put the valve to the crucial test, by filling the stomach with milk and having the patient cough violently, and shifted him in every possible position to favor leakage; but the valve remained true to its purpose and there was not a vestige of regurgitation, a positive clinical demonstration. The wound contracted so that the mouth of the fistula was the only portion of the stomach exposed.

Note.—Since the preparation of this paper, I find in the *New York Medical Journal* of Nov. 7, 1896, that Dr. Willy Meyer describes a modification of Witzel's operation devised by Dr. Bronislaw Kader, assistant in the surgical clinic of Professor Mikulicz of Breslau. In this operation the stomach is inverted in the manner I describe, except that the inversion is carried to a greater degree by making two rows of Lembert sutures, instead of one; the principle being to form a canal of serous tissue. The rectus muscle is bluntly divided as in the Von Hacker operation, in order to be utilized for sphincter action.

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